

A REVISION OF THE TROGLOPHILIC GENUS *BRISES* PASCOE, WITH A DISCUSSION OF THE
CYPHALEINI (COLEOPTERA, TENEBRIONIDAE)

by

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ABSTRACT

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Eight species and one subspecies of *Brisés* Pascoe are recognized, keyed, and briefly described. Four of the species are new and named *caraboides*, *katherinae*, *occidentalis*, and *nullarboricus*. The specific name *duboulayi* Bates becomes a subspecies of *acuticornis* Pascoe, and *granulatus* Carter becomes a synonym of the latter. There is a brief discussion of the cave and burrow frequenting habits of *Brisés*.

A number of former subfamilies and tribes of Australian Tenebrionidae are combined into the single tribe Cyphaleini and adult diagnostic characters for the latter are proposed.

INTRODUCTION

The genus *Brisés* Pascoe, 1869, comprises eight known species whose distributions are practically confined to the arid zone of Australia, with most known records being within South Australia (Fig. 23). It is unique among Australian Tenebrionidae in that the majority of species have been recorded from caves and mammal burrows.

Brisés belongs to the very large and diverse Australasian endemic tribe Cyphaleini (subfamily Tenebrioninae) which represents the most important of the three dominant elements of the Australian tenebrionid fauna, the others being the Adeliini (subfamily Lagriinae) and Amarygmmini (subfamily Tenebrioninae) (Kaszab 1982). Having probably originated as forest-inhabiting, rotten-wood-feeding forms (as many still are) certain elements of the Cyphaleini invaded the arid zone to become soil inhabiting as larvae and ground foraging as adults, but they do not remain active under daytime conditions as do many African desert tenebrionids. The concept of the tribe Cyphaleini adopted here largely conforms to that implied by Doyen and Tschinkel (1982) and includes all the members of the "subfamilies" Helaeinae, Nyctozoilinae, Briseinae, and Cyphaleinae of Carter (1926), a total of 46 genera and some 450 species in Australia and New Guinea, plus the 14 species of *Mimopeus* Pascoe in New Zealand (Watt 1968).

The following abbreviations for institutional names are used in the text and follow the four-letter system proposed by Watt (1979):

- AMSA —Australian Museum, Sydney.
- ANIC —Australian National Insect Collection, Canberra.
- BMNH —British Museum (Natural History).
- MVMA —Museum of Victoria (Natural History and Anthropology), Melbourne.
- QMBA —Queensland Museum, Brisbane.
- SAMA —South Australian Museum, Adelaide.
- UQBA —University of Queensland Entomology Department, St Lucia.
- WAMA —Western Australian Museum, Perth.

The primary types of all the taxa of *Brisés* have been seen by the author.

The Limits of the Cyphaleini and Tenebrionini

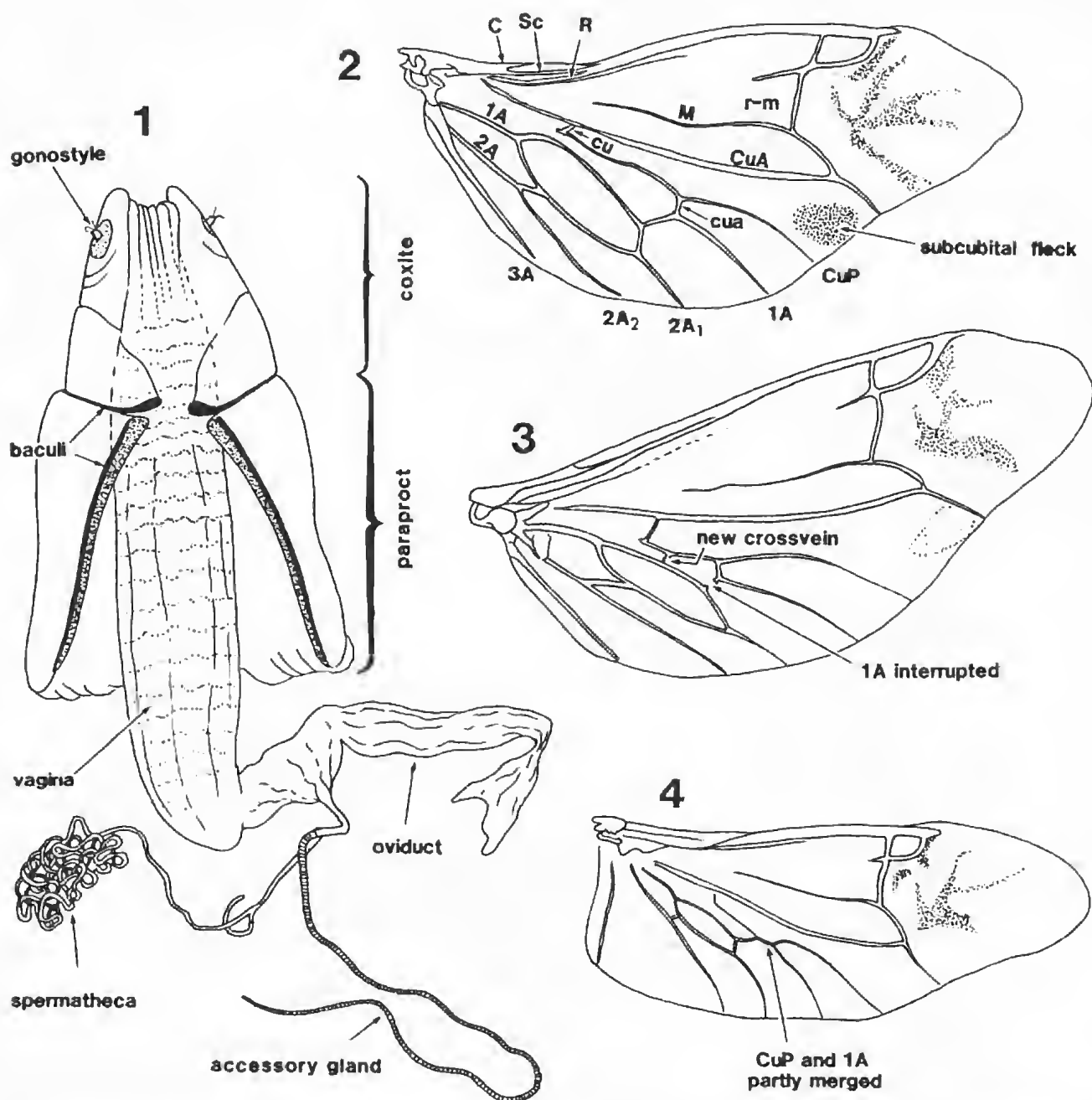
As discussed by Doyen and Tschinkel (1982), these two tribes belong to the "tenebrionine lineage" which is characterised in part by having the spermatheca derived from the original bursa copulatrix (which has disappeared as a recognizable entity), by the orientation of the coxite and paraproct baculi of the ovipositor being transverse and oblique respectively (Fig. 1), and by the defensive gland reservoirs opening between sternites 7 and 8 and being small and not reinforced by helical thickenings (Tschinkel and Doyen 1980). These three features are shared with the closely related toxicine and opatrine lineages (best treated as further tribes of the Tenebrioninae) and sharply distinguish these lineages collectively (in effect the subfamily Tenebrioninae) from other subfamilies. The above authors do not propose any formal classification, but I equate the subfamily Tenebrioninae with their tenebrionine, toxicine, and opatrine lineages.

The Tenebrioninae (as understood here) are further characterised by a number of primitive features, including the almost complete absence of the clustered antennal sensoria termed "tenebrionid sensory organs" by Medvedev (1977) and, inconsistently in apparently primitive elements, internally open fore coxal cavities and a subcubital fleck on the wings (Fig. 2).

The two tribes Tenebrionini and Cyphaleini share all of the above features, at least in part, and in a natural system could not be satisfactorily separated. However,

the resulting group would be rather unwieldy on a world-wide basis and it is desirable for purely practical purposes to try to find an arbitrary line of separation. Watt (1974) suggests a larval character—a crenulate spiracular peritreme, combined with a primitive adult character—the subcubital fleck, to characterise Cyphaleini. However, too few larvae are known for us to be able to understand the significance of the spiracular character, and the adult one is not only plesiomorphic but also by no means universal in the Cyphaleini. For practical reasons I prefer to draw the line at an adult apomorphic character—the absence of original elytral striae—to recognise Cyphaleini, when combined with certain other features.

Specifically, Cyphaleini may be considered to be members of the Tenebrioninae which share the following adult characters (A—apomorphic; P—plesiomorphic): (1) absence of tenebrioid sensoria (P), (2) internally open fore coxal cavities (P), (3) the third antennal segment longer than the preceding or following ones (A), (4) the original nine elytral striae entirely absent, the elytra either non-striate or with secondary, usually supernumerary striae (A), (5) no sexual dimorphism in the shape of the fore legs (P), and (6) the parameres of the aedeagus with a vestiture of minute spines (A?). As far as I know, all Cyphaleini share the above features, but conversely none of the features are exclusive to the group. *Meneristes* Pascoe,



FIGS. 1-4. 1. Ovipositor and internal female genital apparatus of *Brises a. acuticornis* Pascoe. 2. The tenebrionine wing venation (*Meneristes australis* Blessig). Venation nomenclature after Medvedev (1968). 3. The cyphaleine wing venation (*Brises a. acuticornis* Pascoe). 4. The coelometopine wing venation (*Encyalesthus atroviridis* Macleay).

in particular, is a transitional genus between Cyphaleini and Tenebrionini, since it displays characters 1, 2, 3, and 6, but not 4 and 5, and it was placed in the Cyphaleini by Wati (1974), a position supported by Doyen and Tschinkel (1982). I prefer to consider the elytral character (4) to be decisive, because of the ease with which it can be seen, and so place *Meneristes* in the Tenebrionini.

Additional characters which are frequent but not universal in the Cyphaleini are the presence of a subcubital fleck on the hind wings (P) (in ten of the 20 winged genera examined, but not in *Brises*), the last maxillary palpal segment triangular or securiform (A) (29 of 33 genera), a shortening of the parameres in relation to the tegmen of the aedeagus (A) (14 of 33 genera examined) and a sclerotisation of the median lobe, often in a characteristic form (arrow-shaped in *Brises*) (A). In addition, eight of the winged genera examined (*Brises* Pascoe, *Pterohelaeus* Breme, *Emcephalus* Kirby, *Paraphanes* Macleay, *Ospidus* Pascoe, *Barytiphia* Pascoe, *Anausis* Bates and *Chartopteryx* Westwood) display a venational peculiarity illustrated in Fig. 3, whereby 1A is broken at one spot and a new cross vein appears, usually only as a stub, further proximad between CuP and 1A (compare the normal tenebrionine venation seen in *Meneristes*, Fig. 2). The latter configuration also appears in at least 12 genera of Cyphaleini, so wing venation cannot be used reliably as a tribal character.

The genus *Titaena* Erichson clearly belongs in the Cyphaleini as here conceived since it shows all the diagnostic features mentioned above except (3) and some of the additional characters (a subcubital fleck, securiform maxillary palpal segment, and sclerotisation of the median lobe). However, *Titaena* is apparently also close to *Artystona* Bates of New Zealand and *Callismilax* Bates of New Caledonia, all three placed in a tribe Titaenini by Kaszab (1982). The latter two genera display the full complement of original elytral striae (at least in some species) and so do not fall within the Cyphaleini as here arbitrarily defined. I have not closely examined *Artystona* and *Callismilax* and prefer to leave the question of their relationship (and therefore that of *Titaena*) in abeyance.

It should also be mentioned here that the subfamily Coelometopinae, which is sharply distinctive on female genital and gland reservoir characters (Doyen and Tschinkel 1982), can often also be recognized by a characteristic wing venation in which the veins CuP and 1A have completely merged for a short distance, swallowing crossvein cu-a (Fig. 4). This modification is accompanied by a reduction of the vannal area. However, a few coelometopines have a normal tenebrionine venation (e.g. *Tetragonomenes* Chevrolat, *Chariotheca* Pascoe). Coelometopinae strongly resemble Tenebrionini in external form but can always be recognized without dissection by the presence of

tenebrionid sensoria on the antennae, universal in the group. The following coelometopine genera were erroneously placed in the Tenebrioninae by Carter (1926): *Hypaulax* Bates, *Hydissus* Pascoe, *Encyalesthus* Motschulsky, *Setemis* Motschulsky, *Promethis* Pascoe, *Tetragonomenes* Chevrolat, *Oectosis* Pascoe and *Zophophilus* Fairmaire (the correct placement of some of these genera has already been proposed by Doyen and Tschinkel (1982)).

The Australian genera which I consider to be true Tenebrionini are *Asphalus* Pascoe, *Sloanea* Carter, *Meneristes* Pascoe, an unnamed genus comprising the species *colydioides* Erichson, *rectihasis* Carter and *sydneyanus* Blackburn, all three erroneously put in *Menephilus*, and *Paratoxicum* Champion.

The 46 genera of Cyphaleini will not be listed here but can be obtained from Carter's (1926) checklist under the "subfamilies" Helaeinae, Nyctozoilinae, Briscinae, and Cyphaleinae.

Subgroups of Cyphaleini and Recognition of *Brises*

The placing of the cyphaleine genera in four separate subfamilies by Carter (1926) suggests that some natural groupings may exist within the tribe, perhaps at subtribal level. In the course of the present study I dissected representatives of 33 cyphaleine genera but was unable to arrive at any arrangement, and believe that the former categories cannot be maintained at any level. There is no concordance in the pattern of variation of characters, whose states consequently follow a mosaic distribution. This is a characteristic feature of the Tenebrionidae as a whole and one which has so far defeated all attempts to arrive at a convincing natural classification of the family (Doyen and Lawrence 1979; Doyen and Tschinkel 1982).

Brises itself was singled out by Carter in 1914, and placed in its own subfamily in 1926, because of a number of ostensibly unique features, specifically the narrowly triangular shape of the last maxillary palpal segment (normally strongly securiform in Cyphaleini), the narrow posterior intercoxal process, the elongate legs, and the long tibial spurs and tarsal claws. After a detailed examination of representative Cyphaleini I find it difficult to understand just what is so unusual about *Brises*. All of the above characters recur in other genera (but not in the same combination). Like all cyphaleine genera *Brises* may be recognized only through a unique combination of a number of characters, enumerated for *Brises* below under "Diagnosis". It also has a distinctive habitus resembling that of cursorial carabid beetles, due mainly to its relatively narrow prothorax and long legs. This characteristic build is the principal feature distinguishing it from some species of *Pterohelaeus* Breme, in which the outlines of the pronotum and elytra are confluent, but which in other respects resemble *Brises*. *Pterohelaeus* itself appears to be a composite taxon.

Adaptations of *Brises*

The Cyphaleini are a relatively primitive group of Tenebrioninae which has radiated extensively in the Australian region in the absence of the subfamily Pimeliinae (Tentyriinae), which elsewhere tends to become dominant in similar xeric situations. *Brises* itself has evolved a strategy of utilising caves and burrows for daytime shelter at least. Six of the nine taxa have been recorded from caves (*caraboides*, *a. acuticornis*, *a. duboulayi*, *katherinae*, *occidentalis*, and *trachynotoides*), and three of these (the two subspecies of *acuticornis*, and *trachynotoides*) from rabbit burrows as well. Two of the remainder are recorded from rabbit burrows only (*blairi* and *parvicollis*), only *nullarboricus* being without any data on shelters used.

G. B. Monteith (*in litt.*) writes that south of Birdsville *blairi* once came out at night in August in enormous numbers foraging on the crests of sandhills, even though it was freezing cold. *B. a. acuticornis* feeds inside caves and so, presumably, does *katherinae* (see accounts under species). Feeding habits of the other species are not known. Larvae which have been found in caves and burrows in association with *Brises* adults are assumed to belong to the latter, but some *Helaeus* species also use burrows (Matthews 1985) and it is necessary to rear larvae through to confirm their identity.

By examination of gut contents and through observation of captive specimens of *acuticornis* I infer that the adults are general scavengers like most tenebrionids. In burrows they (and presumably all other species of the genus) are probably coprophagous on the droppings of the mammal inhabitants, and in caves they appear to feed on all faecal matter available and on carrion.

Adaptation of *Brises* to life in caves and burrows is barely reflected in their structure. Long appendages, small eyes and a large hind body are features often seen in cavernicolous beetles, as is wing reduction. In all these respects *Brises* is only at the earliest stage of modification, *caraboides* being the most modified. Only two species appear to be flightless and only five have eyes measurably smaller than those of winged epigeal genera. Intensity of pigmentation is at normal levels, but paler specimens are common in *duboulayi*. Altogether, the morphology of the species suggests that there is frequent migration from one burrow or cave to another.

SYSTEMATICS

Brises Pascoe

Brises Pascoe, 1869, p. 145; Carter, 1914, pp. 45, 46; Carter 1926, pp. 127, 145.

Ephidonium Pascoe, 1869, p. 151; Carter, 1914, p. 45 (syn.).

Type Species: Of *Brises*: *Brises trachynotoides* Pascoe, 1869, by monotypy. Of *Ephidonium*: *Ephidonium acuticornis* Pascoe, 1869, by monotypy.

Description: Entirely black.

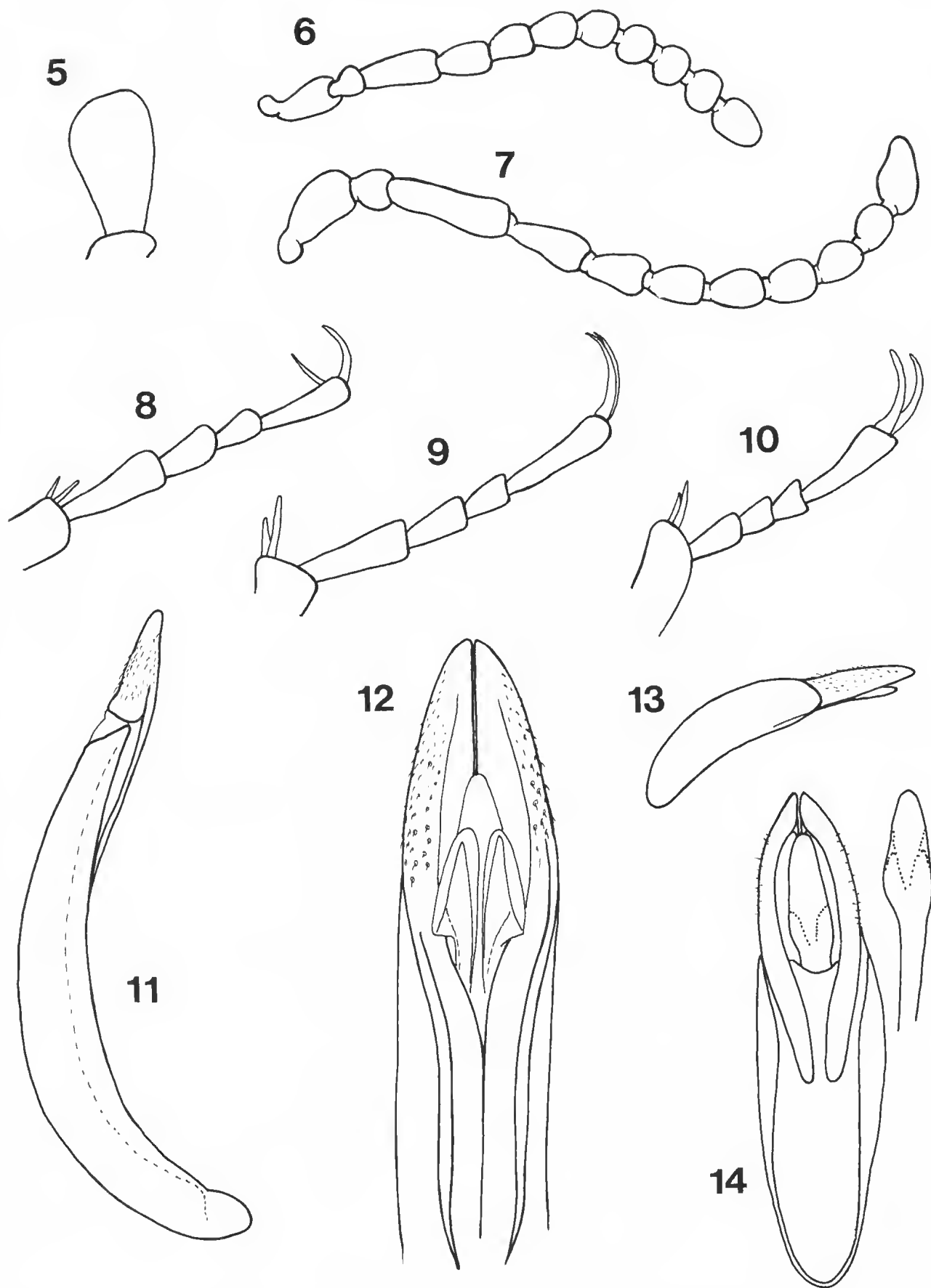
Head: Anterior margin of clypeus concave. Clypeo-frontal suture complete or not. Basal membrane of labrum visible from above. Eyes entire but constricted by both canthus and edge of occiput, the dorsal interocular distance $2\frac{1}{2}$ -5 times width of one eye. Gular sutures meet near middle, no gular pits, anterior edge of gula unmodified. Bridge of tentorium straight. Third antennal segment longer than 2nd or 4th. Tormae of labrum transverse, without prominent anterior extensions. Mandibles bidentate, mola not striate. Lacinia unarmed. Terminal segment of maxillary palpus narrowly triangular to sublinear (Fig. 5), of labial palpus sublinear. Angles of mentum anterior, subacute.

Thorax: Margins of pronotum prominent but rarely strongly explanate, anterior edge evenly arcuate. Outline of pronotum not confluent with that of elytra, narrower. Pronotum glabrous or with minute, very fine setae. No sharp prosternal keel. Fore coxal cavities open internally. Mesosternum strongly excavate to receive prosternal process. Metendosternite Y-shaped, with laminae. Scutellum visible, small, in form of subequilateral triangle. Elytra glabrous or with minute setae, true striae absent, carinae present or not. Epipleura moderately wide, complete. Wings without subcubital fleck or with faint trace of one, with base of first branch of 1A broken and partial supplementary cross vein cu-a present (Fig. 3). Tarsi slender, claws long, equal in length to about $\frac{2}{3}$ of last tarsal segment. Tarsal vestiture in form of long bristles. Tibial spurs equal in length to $\frac{1}{3}$ - $\frac{1}{2}$ length of metatarsus. Legs slender, without carinae.

Abdomen: Intercostal process of first visible abdominal sternite narrowly triangular. Reservoirs of defensive glands small, simple. Ovipositor and internal female genital tract of tenebrionine type (Fig. 1). Parameres of aedeagus spinose, comprising $\frac{1}{4}$ - $\frac{1}{3}$ of total aedeagal length, with backward prolongations. Median lobe arrow-shaped or simply expanded subapically (Figs. 11-14).

Total length 10-25 mm.

Diagnosis: Eyes in dorsal view ovoid or subquadrate, not strongly transverse, interocular distance equal to $2\frac{1}{2}$ -5 eye widths. Membrane at base of labrum exposed by concavity of clypeal margin. Last segment of maxillary palpus narrowly triangular. Pronotum glabrous, markedly narrower than elytral bases and not confluent in outline with elytral edges. Elytra glabrous or with minute setae, the lateral margins not expanded. Wings (when present) without distinct subcubital fleck. Legs slender, femora extending for about $\frac{1}{4}$ - $\frac{1}{3}$ of their length beyond body sides. Tibial spurs equal to $\frac{1}{3}$ to



FIGS. 5-14. 5. Outline of terminal maxillary palpal segment, *Brises trachynotoides* Pascoe. 6. Antenna, *Brises nullarboricus* n. sp. 7. Antenna, *Brises a. duboulayi* (Bates). 8. Hind tarsus, *Brises caraboides* n. sp., setae omitted. 9. Hind tarsus, *Brises occidentalis* n. sp. 10. Hind tarsus, *Brises trachynotoides* Pascoe. 11. Aedeagus of *Brises a. duboulayi* (Bates) in side view. 12. Apex of aedeagus of *Brises a. duboulayi* (Bates) in ventral view, showing arrow-shaped end of median lobe. 13. Aedeagus of *Brises trachynotoides* Pascoe in side view. 14. Aedeagus of *Brises trachynotoides* Pascoe in ventral view, median lobe also shown partly extracted.

½ length of metatarsus. Claws long, equal in length to about ⅔ of last tarsal segment. Tarsi bristled beneath, not tomentose. Intercostal process of first visible abdominal sternite narrowly triangular.

Distribution (Fig. 23): All of South Australia except the southeastern portion; New South Wales west of the Great Dividing Range; southwestern Queensland; the Northern Territory from Katherine southward; the Nullarbor, Central, and North West districts of Western Australia. Probably occurring in all parts of Australia receiving less than 300 mm of annual rainfall, with populations substantially outside this area possibly isolated and restricted to caves.

KEY TO THE SPECIES AND SUBSPECIES OF *BRISES*

- 1 (2) Humeral angles strongly explanate. Elytral length about 1.3 times basal elytral width. Wingless (Fig. 24) 1 *blairi* Carter
 Humeral angles rounded. Elytral length 1.6-2.1 times basal elytral width. Wings present but may be reduced 2
- 2 (1) Elytral surface with punctures arranged in rows, sometimes irregular. Granules or spines, if present, also in rows. Head and pronotum usually shagreened and punctate. Terminal antennal segment more or less acuminate (Fig. 7). No sexual dimorphism 3
 Elytral surfaces coarsely reticulo-punctate and granulate, the punctures and granules never in rows on disc at least. Head and pronotum densely vermiculate or granulate. Terminal antennal segment not acuminate, at most somewhat narrowed apically (Fig. 6). Male with middle and hind femora modified (Figs. 19-22) 8
- 3 (2) Pronotal surface shiny, finely shagreened and punctate only, without granules 4
 Pronotal surface matt, with at least a few small granules 6
- 4 (3) Hind body oval (Fig. 25), flightless. Elytra with the intervals between low, rounded carinae coarsely and densely punctate, without granules 2 *caraboides* n. sp.
 Hind body oblong (Fig. 26), wings normal. Elytral surface finely punctate, with or without granules and carinae 5
- 5 (4) Elytra without trace of spines, granules or sharp carinae 3 *aculicornis aculicornis* (Pascoe)
 Elytra with at least a few small granules, may be distinctly granulate and carinate 4 *aculicornis duboulayi* (Bates)
- 6 (3) Head and pronotum coarsely rugose and granulate. Prosternal process with the margins sharply raised between fore coxae. Elytral surface with short setae, more prominent laterally, elytral edges nearly straight in middle (Fig. 29) 5 *katherinae* n. sp.
 Head and pronotum with small granules, the surface between them shagreened and finely rugose. Prosternal process with margin not raised. Elytra without setae, elytral edges distinctly convex throughout (Figs. 30 and 31) 7
- 7 (6) Eyes wider than long, separated by about 4 eye widths (Fig. 17). Elytral carinae very prominent, the surface between them concave and distinctly granulate 6 *occidentalis* n. sp.

Eyes about as long as wide and separated by about 3 eye widths (Fig. 18). Elytral carinae fine, the surface between them flat, minutely granulate, with fine supplementary longitudinal ridges 7 *parvicollis* (Blackburn)

- 8 (2) Clypeus in lower plane than frons, clearly demarcated at base. Front edges of eyes strongly oblique (Fig. 15). Elytra with a short humeral carina (Fig. 32) 8 *nullarboricus* n. sp.
 Clypeus in same plane as frons, not sharply delimited at base. Front edges of eyes more or less transverse (Fig. 16). Elytra without a humeral carina 9 *trachynotoides* Pascoe

1. *Brises blairi* Carter (Fig. 24)

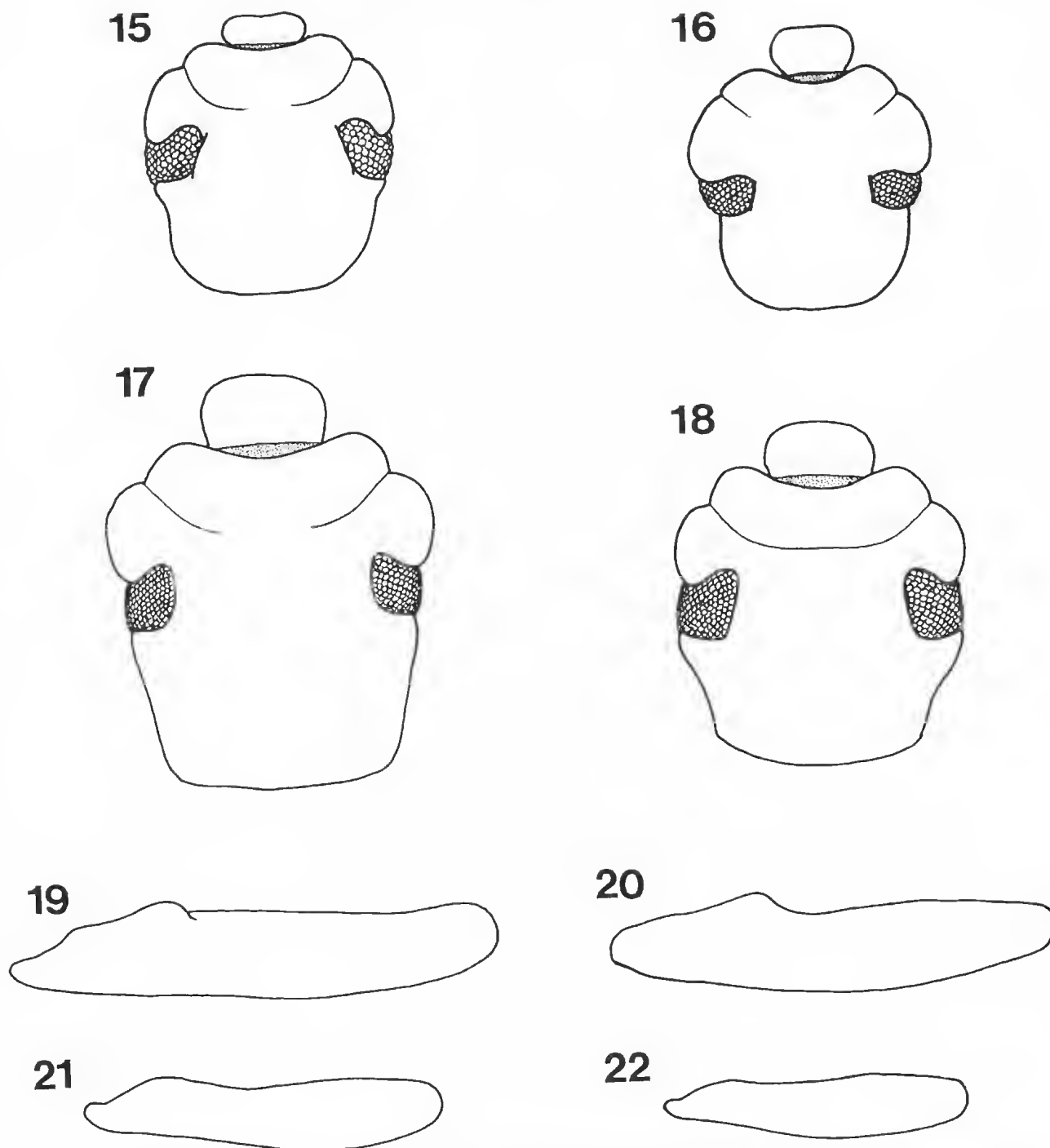
Brises blairi Carter, 1914, p. 58; Carter, 1926, p. 145.

Description: Mentum with two pits and broad anterior membranous area. Terminal antennal segment apically narrowed but obtuse. Clypeus in lower plane than frons. Eyes with length subequal to width in dorsal view, separated by a distance equal to about 2½ eye widths. Edges of prosternal process not raised. Pronotum 1.7-1.9 times as wide as long with margins strongly explanate. Pronotal surface alutaceous, with scattered very fine punctures. Elytral surfaces with very small granules, denser anteriorly, and very small punctures more evident anteriorly and along sides, the surface between them alutaceous, without setae. Two incomplete raised carinae or rows of granules on each elytron. Ratio of elytral length to width across bases about 1.3:1. Hind wings almost entirely atrophied. Longest hind spur equal to more than ½ length of metatarsus. Parameres making up about ¼ of total aedeagal length. No sexual dimorphism. Total length 15-20 mm.

Distribution and habitat: The north-east quarter of South Australia and adjacent areas of Queensland and the Northern Territory. Not recorded from caves but found in rabbit burrows and in the open on sand ridges at night, sometimes in large numbers. Collected from July to May.

Type: Killalpanima, S.A., 100 miles east of Lake Eyre (H. J. Hillier), ♂. BMNH.

Specimens examined (119): SOUTH AUSTRALIA. Alton Downs (old) H.S., 48 km SW by W of Birdsville. Birdsville, 25 mi S of Clayton R., near bore drain. Cooper's Creek. Diamantina R., 25 mi S of Birdsville. Hay R., 24 mi W of camp J3. Innamincka, Brodie's Water Hole. Lake Eyre, Madigan Gulf, Sulphur Peninsula. Lake Eyre, Prescott Peninsula. Lake Kittakittaooloo, S shore. Lake Palankarinna. Minnie Downs, NE corner. Mt. Gason, 41 km SSW of Clifton Hills. Mungeranie Sta., water hole. Mungeranie, 20 mi S of. Purni Bore, Simpson Desert, 6 km WSW of, pit traps in sand ridge. Simpson Desert. Warburton R., 2 km NE of Kalamurina H.S. Warburton R., New Kalamurina H.S. NORTHERN TERRITORY. Andado H.S., 15 km ENE of. Finke R., McDonnell Ranges. Hermannsburg. Indracowra, 5 mi N of, ex pit traps in rabbit burrows. QUEENSLAND, Arrabury, 20 mi N



FIGS. 15-22. 15. Head, *Brises nullarboricus* n. sp. 16. Head, *Brises trachynotoides* Pascoe. 17. Head, *Brises occidentalis* n. sp. 18. Head, *Brises parvicollis* (Blackburn). 19. Hind femur of ♂, *Brises trachynotoides* Pascoe. 20. Middle femur of ♂, *Brises trachynotoides* Pascoe. 21. Hind femur of ♂, *Brises nullarboricus* n. sp. 22. Middle femur of ♂, *Brises nullarboricus* n. sp.

of, on road to Planet. Birdsville. Birdsville, 30 km W of, Bluff Sta. Diamantina R. Kaliduwarry Sta., Camp 20. Specimens are located in AMSA, ANIC, QMBA, SAMA, UQBA, and WAMA.

2. *Brises caraboides*, n. sp.
(Figs 8, 25)

Description: Mentum without pits, with irregular surface and narrow anterior membrane. Terminal antennal segment subacuminate. Clypeus in lower plane than frons. Eyes somewhat wider than long in

dorsal view, separated by a distance equal to about $3\frac{1}{2}$ eye widths. Edges of prosternal process not raised. Pronotum about 1.3 times as wide as long. Pronotal surface finely shagreened, with scattered fine punctures. Humeri rounded. Elytral surfaces with about 15 rows of coarse punctures in straight lines, closely spaced between four low, more or less evenly spaced rounded longitudinal ridges on each elytron, without earinae, with short fine setae. Ratio of elytral length to width across bases about 1.9:1. Hind wings reduced to about half of elytral length. Longest hind spur equal to about $\frac{1}{3}$ of metatarsus. Parameres

making up about $\frac{1}{4}$ of total aedeagal length. Total length 18-19 mm.

Remarks: The species is closely related to *acuticornis*, within whose range it occurs and from which it differs mainly in pronotal and elytral shape and puncturation, by being flightless, and by having longer legs. The narrow humeri indicate that wing atrophy is of long standing and no intermediate forms are known to exist between *caraboides* and *acuticornis*.

Distribution and habitat: The type locality only. Collected in an "alcove at base of cliffs".

Type: Twilight Cove, Eucla Basin, W.A., 5.XI.1966, J. Lowry, σ . ANIC. *Paratype:* One σ , with same data as holotype, ANIC.

Brises acuticornis (Pascoe)

Description: Mentum without pits, sparsely punctate, with posterior V-shaped grooves enclosing raised area. Terminal antennal segment acuminate. Clypeus in lower plane than frons. Eyes about as wide as long, separated by a distance equal to about 4 eye widths. Edges of prosternal process not raised. Pronotum 1.4-1.5 times as wide as long. Pronotal surface alutaceous, finely and sparsely punctate. Elytral surfaces variable (see under subspecies), with short setae. Ratio of elytral length to width across bases 1.6-1.7:1. Hind wings fully developed. Longest hind spur equal to about $\frac{1}{2}$ length of metatarsus. Parameres making up about $\frac{1}{4}$ of total aedeagal length. No sexual dimorphism. Total length 15-25 mm.

I recognize the following two subspecies (taxa 3 and 4).

3. *Brises acuticornis acuticornis* (Pascoe) (Figs 1, 3, 26)

Ephidonius acuticornis Pascoe, 1869, p. 151.

Brises acuticornis, Carter, 1914, pp. 45-46; Carter, 1926, p. 145; Hamilton-Smith, 1967a, pp. 37-39, 41; Hamilton-Smith, 1967b, pp. 115-116; Richards, 1971, pp. 17-45 *passim*.

Description: Elytral surfaces with small punctures set in longitudinal rows between three low ridges on each elytron, without granules or spines.

Distribution and habitat: This subspecies generally occurs in the coastal areas of South Australia and the Nullarbor Plain. There are numerous records from caves, from both the light and dark zone, often associated with guano and carrion. Probable larvae have been collected inside caves and one collector (M. Gray) reports that adults and larvae feed on weta (raphidophorid cricket) excreta in Weebubbie Cave. Collected from July to April.

In her study of the cavernicolous fauna of the Nullarbor Plain, Richards (1971) reports *B. acuticornis* from 25 caves throughout the region, mostly in the dark

zone up to 4 km from the entrance. Dry, powdery bat guano supports large populations of adults and larvae, and this species is the only coprophage to occur in both bird (swallow) and mammal faeces, including human excrement and fox droppings. It also occurs in rabbit burrows on the plain.

Type: Lectotype (sex undetermined) from Gawler, S.A., hereby designated from two syntypes in the Pascoe Collection (BMNH).

Specimens examined (174): SOUTH AUSTRALIA. Ardrossan. Ceduna. Cook, 9 mi E of. Denial Bay, 1 mi S of. Diprose Cave No. 3. Eucla Basin, cave N 149. Fisher, E-W Railway. Fowler's Bay. Gawler. Koonalda Cave sinkhole. Koonalda H.S., 10 km SE by E of. Koonalda Sta., blowhole entrance. Koonalda, N 33 sinkhole (amongst dead birds). Koonibba. Koorngabie Sta. Murrawijinee Cave N 7, Nullarbor. Murray R. Ooldea. Pt Pierce Mts, Yorke Peninsula. Swan Reach. Punyelroo Cave. Thylacine Hole, Eucla Basin. Wardang I. White Wells Cave. Winbirra Cave, Eucla Basin. Yorke Peninsula. WESTERN AUSTRALIA. Abrakurrie Cave N 3, Nullarbor. Caiguna and Cocklebidy, halfway between, ex rabbit burrow. Cocklebidy Cave, doline. Dingo Cave N 160, Nullarbor Plain, on guano. Eucla. Eucla, 32 mi SE of Coongana, Nullarbor. Eyre's Sand Patch. Madura, 6 mi S of, cave. Madura, 8 mi Cave. Madura, main cave N 62. Moonera Tank Cave, Nullarbor. Mullamullang Cave, Nullarbor, dark zone, feeding on dead bat. Murra-el-elvyn Cave, Nullarbor, light and dark zones, on dry guano. Nullarbor, 50 km W of; 64 km E of; 7 km WSW of. Nullarbor H.S. Pannikin Plain Cave, dark zone. Petrogale Cave, $\frac{1}{2}$ mi S of, N 79, E of Madura. Swallow Cave, Cocklebidy, near dead bat. Tommy Graham's Cave N 56, Nullarbor. Weebubbie Cave N 2, Nullarbor. Specimens are located in AMSA, ANIC, BMNH, QMBA, SAMA, UQBA, and WAMA.

4. *Brises acuticornis duboulayi* (Bates), new status (Figs 7, 11, 12, 27, 28)

Ephidonius duboulayi Bates, 1872, p. 279.

Brises duboulayi, Carter, 1914, p. 45; Carter, 1926, p. 151.

Brises granulatus Carter, 1921, p. 316 (new synonymy).

Description: Distinguished from *a. acuticornis* only by the sculpturing of the elytra, which show at least a trace of small granules or spines and an accentuation of the ridges. In the extreme form, the elytra are distinctly spinose and strongly carinate. There is a gradual intergradation between typical *a. acuticornis* and *a. duboulayi* along geographical gradients (see below).

Distribution and habitat: This widespread subspecies is essentially the inland race of *acuticornis*, but it reaches the coast on Eyre Peninsula, where it is also

in its least granulate form. This form could have been ascribed to *a. acuticornis*, but it is more convenient for nomenclatorial purposes if the latter name is arbitrarily restricted to specimens without any trace of granules, spines, or carinae. Moderately granulate forms without carinae (the former *granulatus*, Fig. 27) are to be found in eastern South Australia from the Adelaide Hills northward and in New South Wales as far east as the foothills of the Great Dividing Range, whilst the most strongly carinate and spinose form (*a. duboulayi* proper, Fig. 28) occurs in northern South Australia from Port Augusta northwards to adjacent states and westwards through the driest parts of Western Australia to the west coast. In parts of South Australia it is difficult to assign specimens to one form or the other.

The Ashford Cave (N.S.W.) population of this subspecies seems to be isolated by many hundreds of kilometres from the nearest other records in western New South Wales, but the intervening area is too poorly collected for us to be sure of this. The few Ashford Cave specimens seen are smaller and paler than other *duboulayi*. The other extreme eastern record, Yiddah, N.S.W., is based on a single old specimen and needs investigation.

There are several other records of the occurrence of this subspecies in caves, and in rabbit burrows (see below). Records are from October to July.

Types: Of *duboulayi*: Champion Bay, W.A., Duboulay, ♂, BMNH. Of *granulatus*: Broken Hill, N.S.W., R. J. Burton, 1/21, ♀, MVMA.

Specimens examined (108): SOUTH AUSTRALIA. Adelaide. Buckalowie Creek, from small cave a little beyond light. Clara St Dora Cave. Cleve. Coober Pedy. Evelyn Downs Sta., Oodnadatta. Everard Ranges to Warburton Ranges. Franklin I. Kingoonya. Kokatha H.S., 17 km SE of, ex pit traps in rabbit burrows. Leigh Creek. Minnipa. Mt Finke, 40 km S Malbooma H.S., ex rabbit warren. Mt Lofty Ranges. Moralana H.S., 22 km WNW of. Murray R. Pt Augusta. Pt Lincoln. Purple Downs, 160 mi NW of Pt Augusta. Streaky Bay. Stuart Ranges. Tarcoola. Whyalla. Wilgi near Loveday, Gilbert's Well. Wilpena Pound, in bat cave in dung. Wooltana Cave, 200 ft underground in bat guano. NEW SOUTH WALES. Ashford Caves via Inverell. Broken Hill. Culpaulin, Darling R. Yiddah. QUEENSLAND. Diamantina. NORTHERN TERRITORY. Alice Springs, 15 km S of, bat caves.

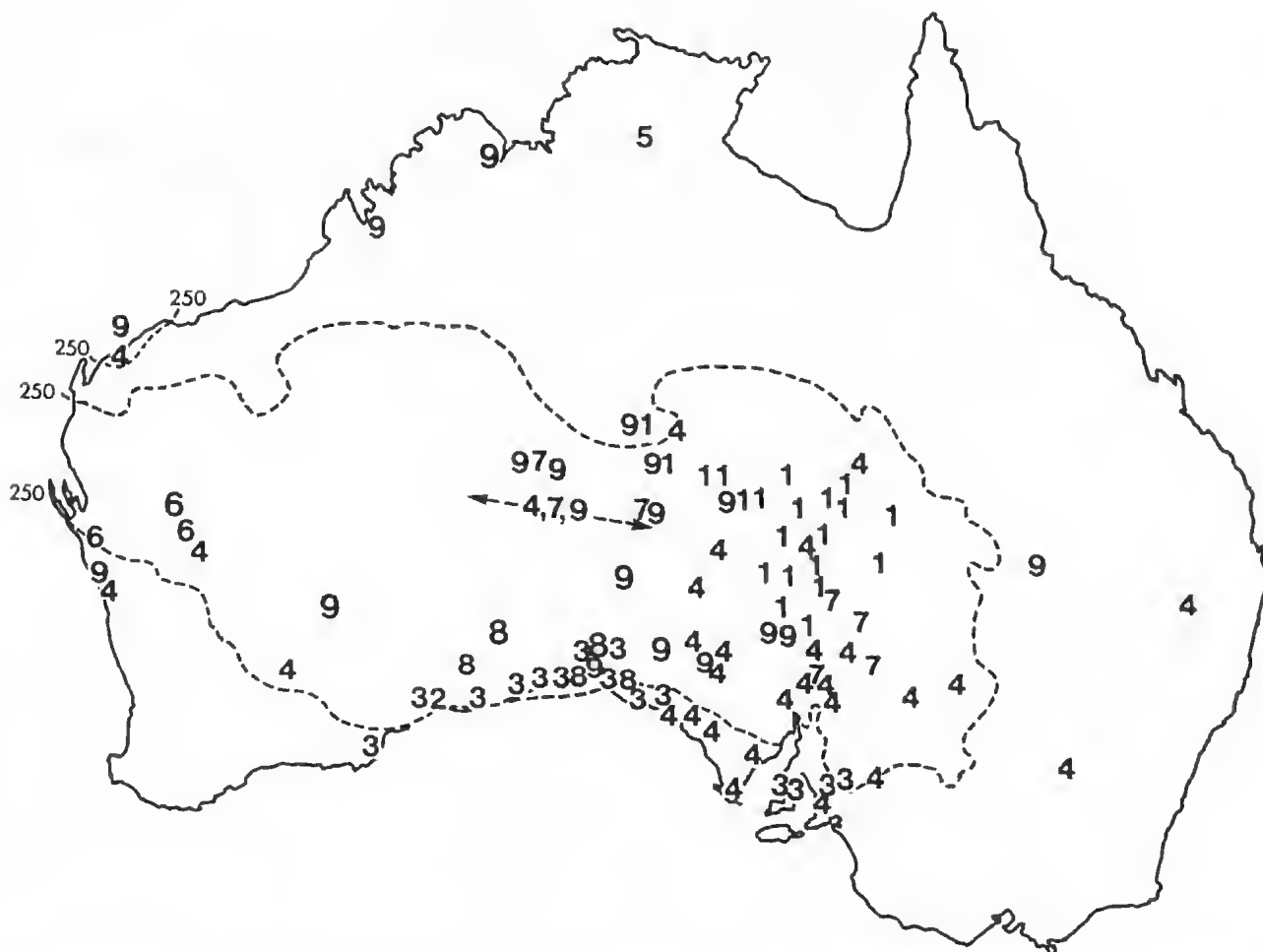


FIG. 23. Distribution of the species of the genus *Brises*. 1—*B. blairi* Carter. 2—*B. caraboides* n. sp. 3—*B. u. acuticornis* (Pascoe). 4—*B. a. duboulayi* (Bates). 5—*B. katherinae* n. sp. 6—*B. occidentalis* n. sp. 7—*B. parvicollis* (Blackburn). 8—*B. nullarboricus* n. sp. 9—*B. trachynotoides* Pascoe. 250 mm annual isohyet shown.

WESTERN AUSTRALIA. Coolgardie. Cue. Onslow. Specimens are located in AMSA, ANIC, SAMA, and UQBA.

5. *Brises katherinae*, n. sp.
(Fig. 29)

Description: Mentum variable, without groove but with either large punctures or oblique depression posterolaterally. Terminal antennal segment acuminate. Clypeus in same or higher plane than frons, not delimited by a sharp depression. Eyes wider than long, the anterior edge strongly oblique, separated by a distance equal to about 2 eye widths. Prosternum feebly ridged before coxae, edges of prosternal process strongly raised between coxae. Pronotum 1.3-1.5 times as wide as long. Pronotal surface irregularly rugose and shagreened, with numerous large shallow punctures and some slightly raised shiny spots on disc. Elytra each with three nearly complete carinae and part of a fourth, and a sutural row of granules, surface between carinae flat, shagreened, with rows of fine but deep punctures and sparse short, curved setae. Ratio of elytral length to width across bases 1.8-2.1:1. Hind wings fully developed. Longest hind spur equal to about $\frac{1}{2}$ of length of metatarsus. Parameres making up about $\frac{1}{4}$ of total aedeagal length. No sexual dimorphism. Total length 15-25 mm.

Distribution and habitat: Known only from the complex of caves near Katherine, N.T. It occurs well inside the dark zone, and has not been collected from outside caves. More collecting in inland northern Australia is needed to establish the distribution limits of this and any other species in the region, in order to determine whether *katherinae* is really as isolated as it appears to be.

Type: Kintore Cave, Katherine, N.T., BS 2134, 12.v.1974, ♂, SAMA, 1 ♂, 155. *Paratypes:* Same data as holotype, 5, SAMA. Cutta Cutta Cave, N.T., 200 m from entrance, 5.xii.1983, W. D. Williams, 2, SAMA. Cutta Cutta Cave, Katherine, N.T. 13.ix.1973, A. Goede, 1, SAMA. Three Mile Cave, Katherine, N.T. 24.vi.1962, R. V. Southcott and N.T. Cave Exploration Group, 2, SAMA. Katherine, N.T., $\frac{1}{2}$ mile from entrance to 16 Mile Cave, June 1962, 1, ANIC. Katherine, N.T., 16 Mile Cave, 12.iv.1963, W. Penman, 2, WAMA.

6. *Brises occidentalis*, n. sp.
(Figs 9, 18, 30)

Description: Mentum with postero-lateral grooves, not joining. Terminal antennal segment acuminate. Clypeus in somewhat lower plane than frons but not sharply delimited. Eyes about as wide as long, separated by a distance about equal to 4 eye widths. Head somewhat elongated behind eyes. Prosternum distinctly carinate before coxae, edges of prosternal process not raised. Pronotum 1.5-1.6 times as wide as long. Pronotal surface shagreened, with indistinct punctures and very small granules regularly spaced.

Elytra each with two strong, nearly complete carinae and two indistinct ridges externally, intervals between them with sparse granules and punctures in irregular rows, without setae. Lateral edges of elytra markedly convex. Ratio of elytral length to width across bases 1.8-1.9:1. Hind wings fully developed. Largest hind spur equal to about $\frac{1}{2}$ of length of metatarsus. Parameres making up about $\frac{1}{4}$ of total aedeagal length. No sexual dimorphism. Total length 19-22 mm.

Distribution and habitat: Known only from three localities in Western Australia situated between Meekatharra and the coast. One of the Wilgie Mia specimens bears the label "Found in cave".

Type: Weld Range, W.A., 2.iii.1963, A. Douglas, ♂, WAMA. *Paratypes:* Same data as holotype, 4, SAMA, WAMA. Milcura H.S. 4 mi W of, 8.xii.1966, W. H. Butler, 1, WAMA. Wilgie Mia W.A. (27 28 S 114 21 E), ix. 1961, D. Merilees, 2, WAMA. Ditto, 1963, A. Douglas, 3, WAMA. Ditto, 16.v.1973, M. Thomas, 1, SAMA.

7. *Brises parvicollis* (Blackburn)
(Figs 17, 31)

Ephidonium parvicollis Blackburn, 1895, p. 52.

Brises parvicollis, Carter, 1926, p. 151.

Description: Mentum with postero-lateral depressions, not meeting. Terminal antennal segment narrowed distally but bluntly rounded. Clypeus in lower plane than frons but not sharply delimited. Eyes large, longer than wide, separated by a distance equal to about 3 eye widths. Head surface finely, densely granulate and shagreened. Prosternum moderately ridged before coxae. Pronotum 1.5-1.7 times as wide as long. Pronotal surface shagreened with numerous very small granules. Elytra each with two sharp but fine, nearly complete carinae, and one or two indistinct ones laterally. Intervals between them shagreened, with distinct straight rows of small punctures and minute granules, without setae. Lateral edges of elytra markedly convex. Ratio of elytral length to width across bases 1.8-2.0:1. Hind wings fully developed. Longest hind spur equal to about $\frac{1}{2}$ length of metatarsus. Parameres making up about $\frac{2}{3}$ of total aedeagal length. No sexual dimorphism. Total length 17-22 mm.

Distribution and habitat: The few available records suggest one focus of distribution in the east central part of South Australia in low-lying areas and another in the mountains of the north-west corner and adjacent ranges of neighbouring states. This species has been collected from rabbit burrows on several occasions but is not known from caves and may be an open-ground forager like *blairi*. September to March.

Type: Lake Callabonna, S.A., A. Zietz, ♀, SAMA. There is no specimen by this name in BMNH. The one in SAMA is not marked type but it bears the name *Ephidonium parvicollis* in Blackburn's writing and the

correct locality and collector, and has been designated as lectotype. Two other specimens with the same data are labelled co-types (that is, paratypes) in Blackburn's hand, and there are five others with the Zietz label, determined by A. M. Lea as co-types, all designated paralectotypes and all in SAMA.

Specimens examined (36): SOUTH AUSTRALIA. Agnes Creek Sta. ex pitfalls in rabbit burrows. Etadunna H.S., 15 km W of. Everard Ranges to Warburton Ranges. Glenmanyie Bore E of Lake Frome, ex rabbit burrows. Lake Callabonna. Lake Mulligan (possibly Mulligan Springs near Lake Callabonna). Lake Palankarina (28 46 S 138 25 E), rabbit burrows. Moralana, 22 km NNW of, rabbit burrows. NORTHERN TERRITORY. Petermann Ranges, Hull R. 33 km ESE of Dörker R. Specimens are located in AMSA, ANIC, and SAMA.

8. *Brises nullarboricus*, n. sp.
(Figs 6, 16, 21, 22, 32)

Description: Mentum with transverse ridges and lateral concavities. Terminal antennal segment broadly rounded. Clypeus in lower plane than frons, sharply set off by a step. Eyes with anterior edges oblique, a little longer than wide, separated by a distance equal to about 3 eye widths. Head surface densely granulate. Prosternum not ridged. Pronotum 1.6-1.7 times as wide as long. Pronotal surfaces densely granulate. Elytra each with two nearly complete carinae and one short humeral carina, rest of surface coarsely reticulo-punctate and granulate, the punctures and granules not in rows, without setae. Ratio of elytral length to width across bases 1.8-1.9:1. Hind wings fully developed. Longest hind spur equal to about $\frac{2}{3}$ length of metatarsus. Parameres making up about $\frac{1}{3}$ of total aedeagal length. Sexual dimorphism evident in shape of middle and hind femur, the hind margin of which is slightly expanded at base in the male. Total length 13-17 mm.

Distribution and habitat: Known only from the Nullarbor Plain, without habitat data.

Type: Nullarbor H.S., 7 km WSW of, S.A., 31 28 S 130 50 E, 11.ii.1978, D. C. F. Rentz and M. J. D. White, Stop 25, ♀, ANIC. *Paratypes:* Same data as holotype, 3, ANIC. Nullarbor H.S., S.A., 10.i.1960, P. Aitken, 1, SAMA. Koorngibbie (Well), S.A., 3, SAMA. 744 Mile Camp, East-West Railway, W.A., F. Mack, 1, SAMA. Fisher, East-West Railway, S.A., Troughton and Wright, 1, AMSA. Reid, 40 mi N of, W.A., 4.ii.1968, 59/3 A. M. Richards, 1, ANIC.

9. *Brises trachynotoides* Pascoe
(Figs 5, 10, 13, 14, 15, 19, 20, 33)

Brises trachynotoides Pascoe, 1869, p. 146, pl. xi, fig. 5; Carter, 1914, p. 46; Carter, 1926, p. 151.

Description: Mentum with indistinct postero-lateral depressions. Terminal antennal segment broadly rounded. Clypeus in same plane as frons. Eyes with anterior edges nearly transverse, wider than long, separated by a distance equal to about $2\frac{1}{2}$ eye widths. Head surface vermiculate. Prosternum slightly ridged before coxae. Pronotum 1.6-1.9 times as wide as long. Pronotal surface vermiculate-granulate. Elytra each with two sharp, nearly complete carinae, no humeral carina, rest of surface reticulo-punctate and granulate, the punctures and granules not in rows, without setae. Ratio of elytral length to width across bases 1.6-1.8:1. Hind wings fully developed. Longest hind spur equal to about $\frac{2}{3}$ of length of metatarsus. Parameres making up about $\frac{1}{3}$ of total aedeagal length. Sexual dimorphism evident in shape of legs, the males having the hind margin of the middle and hind femora angularly expanded and all tibiae distinctly arcuate (straight in the female). Total length 10-17 mm.

Remarks: There is considerable variability both in size and shape in this species, the larger individuals having more explanate and sinuate pronotal margins.

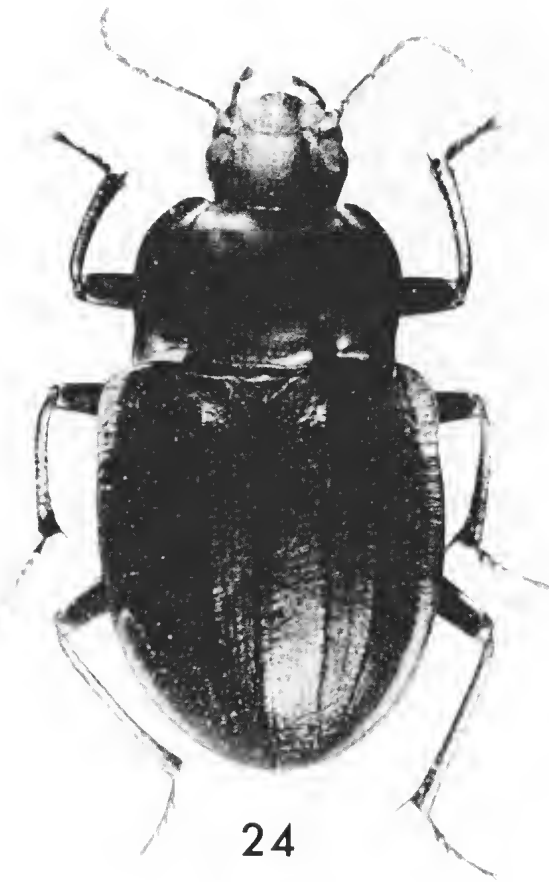
Distribution and habitat: A widespread species occurring in the northern half of South Australia, south-western Queensland, the south of the Northern Territory and all of Western Australia except the South West. It is not frequently encountered, however. Found in rabbit burrows, and there is one series from a cave on Barrow Island, W.A. August to May.

Type: Champion Bay, W.A., ♀, BMNH.

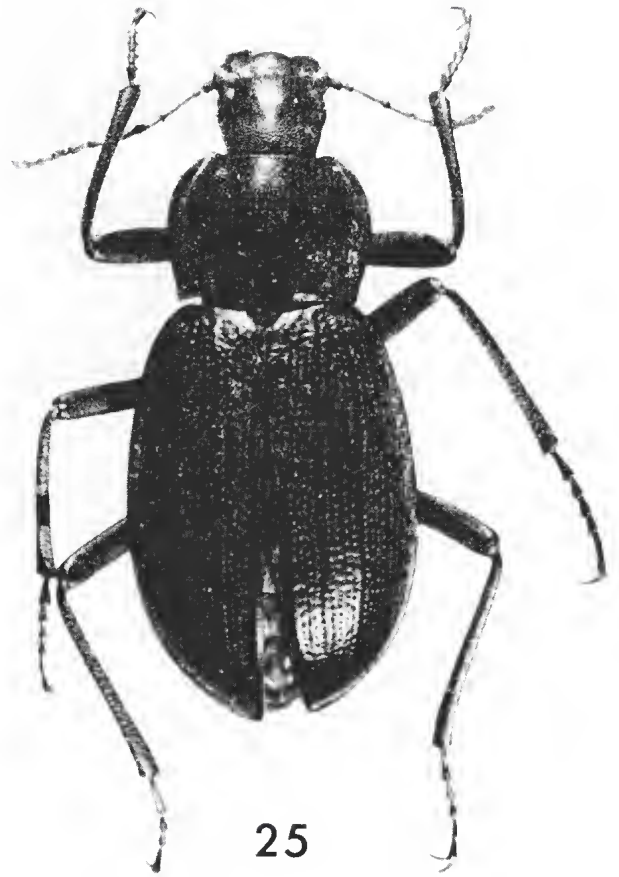
Specimens examined (52): SOUTH AUSTRALIA. Agnes Creek, ex pitfalls in rabbit burrows. Ediacara. Emu, 300 mi NW of Woomera. Everard Ranges to Warburton Ranges. Mt Finke, 40 km S of Malbooma H.S., ex rabbit warren. Purni Bore, Simpson Desert, 6 km WSW of, pit traps on sand ridge. Stuart Creek H.S., 10 km E of. Wynbring. QUEENSLAND. Cunnamulla. NORTHERN TERRITORY. Hermannsburg. Idracowra H.S., 5 mi N of, ex pit traps in rabbit burrows. MacDonnell Ranges. Petermann Ranges. WESTERN AUSTRALIA. Barrow I., cave N of Flacourt Bay. Forrest River District, Gill Pinnacle. Mural Crescent. King Sound. Kookynie. Mt Linden, 7.5 km NNW of. Specimens are located in ANIC, BMNH, QMBA, SAMA, and WAMA.

ACKNOWLEDGMENTS

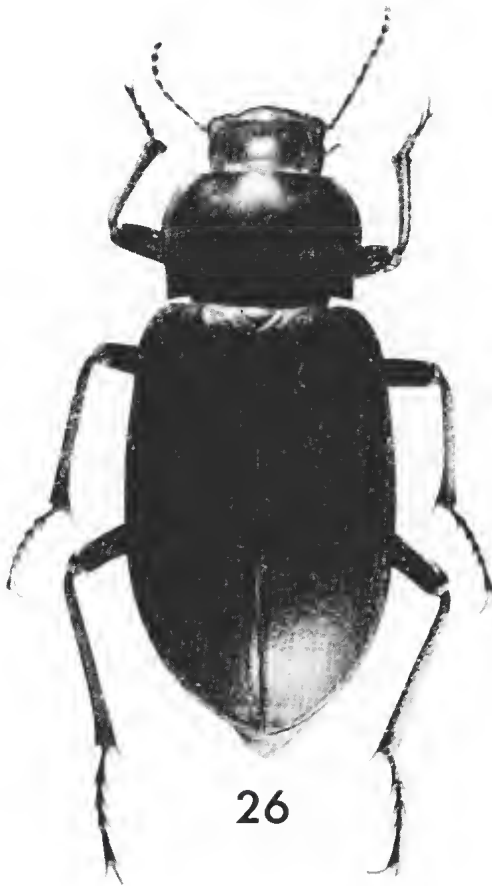
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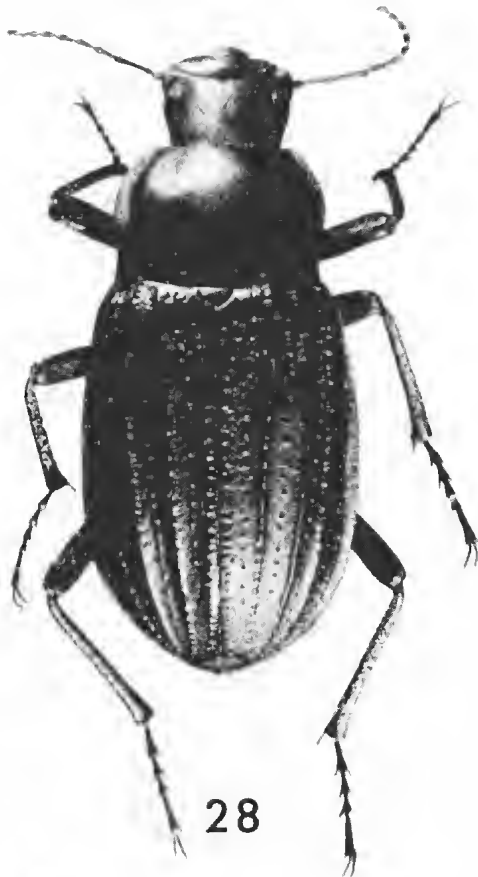


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FIGS. 24-27. 24. *Brises blairi* Carter, ♂. 25. *Brises caraboides* n. sp., ♂. 26. *Brises a. acuticornis* (Pascoe), ♂. 27. *Brises a. duboulayi* (Bates), ♂, granulate (eastern) form. Photos: J. Forrest.



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FIGS. 28-31. 28. *Brises a. duboulayi* (Bates), ♂, carinate (western) form. 29. *Brises katherinae* n. sp., ♂. 30. *Brises occidentalis* n. sp., ♂. 31. *Brises parvicollis* (Blackburn), ♂. Photos: J. Forrest.

REFERENCES

- CARTER, H. J. 1914. Revision of the subfamily Tenebrioninae, family Tenebrionidae. *Proc. Linn Soc. N.S.W.* 39: 44-86.
- CARTER, H. J. 1926. A check list of the Australian Tenebrionidae. *Aust. Zool.* 4: 117-163.
- DOYEN, J. T., and LAWRENCE, J. F. 1979. Relationships and higher classification of some Tenebrionidae and Zopheridae (Coleoptera). *Syst. Ent.* 4: 333-377.
- DOYEN, J. T., and TSCHINKEL, W. R. 1982. Phenetic and cladistic relationships among tenebrionid beetles (Coleoptera). *Syst. Ent.* 7: 127-183.
- HAMILTON-SMITH, E. 1967a. Fauna of the Nullarbor Caves. In "Caves of the Nullarbor" (J. R. Dunkley and T. M. L. Wigley, eds.), pp. 35-42. Speleological Research Council Ltd., Univ. of Sydney. 61 pp.
- HAMILTON-SMITH, E. 1967b. The Arthropoda of Australian caves. *J. Aust. ent. Soc.* 6: 103-118.
- KASZAB, Z. 1982. Die Tenebrioniden Neukaledoniens und der Loyauté-Inseln (Coleoptera). *Folia ent. Hungarica* 43: 1-294.
- MATTHEWS, E. G. 1985. Foraging activity of some tenebrionid beetles in a South Australian mallee area. In "Soil and Litter Invertebrates of Australian Mediterranean-type Ecosystems" (P. Greenslade and J. D. Majer, eds.). *W.A. Inst. Tech., Sch. Biol. Bull.* 12: 63-64.
- MEDVEDEV, G. S. 1968. "Zhuki chernotelki (Tenebrionidae). Podsemeistvo Opatrinae." Fauna SSSR Vol. 19, part 2. Leningrad.
- MEDVEDEV, G. S. 1977. Taksonomicheskoe znachenie antennal'nykh sensill zhukov-chernotelok (Coleoptera, Tenebrionidae). *Tr. Vsesoyuzn. ent. Obshch. AN SSSR* 58: 61-86.
- PASCOE, F. P. 1869. Descriptions of new genera and species of Tenebrionidae from Australia and Tasmania. *Ann. Mag. Nat. Hist.* 3: 29-45, 132-53, 277-96, 344-351.
- RICHARDS, A. M. 1971. An ecological study of the cavernicolous fauna of the Nullarbor Plain, Southern Australia. *J. Zool., Lond.* 164: 1-60.
- TSCHINKEL, W. R., and DOYEN, J. T. 1980. Comparative anatomy of the defensive glands, ovipositors and female genital tubes of tenebrionid beetles (Coleoptera). *Int. J. Insect Morphol. Embryol.* 9: 321-368.
- WATT, J. C. 1968. Specific synonymy in *Mimopeus* Pascoe (*Cilibe* auctorum), and the nomenclatorial status of some related genera (Coleoptera, Tenebrionidae). *N.Z. Ent.* 4: 35-39.
- WATT, J. C. 1974. A revised subfamily classification of Tenebrionidae (Coleoptera). *N.Z. J. Zool.* 1: 381-452.
- WATT, J. C. 1979. Abbreviations for entomological collections. *N.Z. J. Zool.* 6: 516-520.



FIGS. 32-33. 32. *Brises nullarboricus* n. sp., ♀. 33. *Brises trachynotoides* Pascoe, ♂. Photos: J. Forrest.